

**June 24, 2013**

**Groundwater Investigation & Monitoring Workplan  
Former Powerine Refinery  
12345 Lakeland Road, Santa Fe Springs, CA**

**SLIC No. 0318, ID No. 2040071  
CAO 97-118**

Prepared on Behalf of

**Isola Law Group, LLP  
Lodi, California**

Prepared for

**Regional Water Quality Control Board  
Los Angeles Region**

Prepared By

## TABLE OF CONTENTS

TABLE OF CONTENTS.....	ii
List of Tables .....	iii
List of Figures.....	iii
List of Appendices.....	iii
1.0    INTRODUCTION .....	1
1.1    Objective .....	1
1.2    Report Organization.....	1
2.0    SITE BACKGROUND .....	2
2.1    Site Description and History.....	2
2.2    Geology and Hydrogeology.....	2
2.2.1    Regional Geology and Hydrogeology .....	2
2.2.2    Local Geology and Hydrogeology.....	3
2.3    Current Groundwater Monitoring Program .....	4
3.0    GROUNDWATER CHARACTERISTICS OF THE STUDY AREA.....	6
3.1    Regional Groundwater Characteristics .....	6
3.2    Off-Site Impacts .....	7
3.3    Known and Potential Contaminant Sources .....	7
3.4    Groundwater Well Network Data Gaps .....	9
4.0    PROPOSED PLAN .....	11
4.1    Pre-Field Activities .....	11
4.2    Monitoring Well Installation .....	12
4.2.1    Drilling and Sampling .....	13
4.2.2    Free-Phase Petroleum Hydrocarbon (FPPH) Sampling .....	13
4.2.3    Monitoring Well Construction .....	13
4.2.4    Well Development and Groundwater Sampling .....	13
4.2.5    Well Surveying .....	14
4.2.6    Groundwater Sampling and Analysis .....	14
4.3    Data Evaluation and Reporting .....	15
5.0    IMPLEMENTATION SCHEDULE .....	16
6.0    CLOSING .....	17

---

7.0	REFERENCES .....	18
-----	------------------	----

#### List of Tables

Table I	Proposed Well Construction Details
---------	------------------------------------

#### List of Figures

Figure 1	Site Location Map
Figure 2	Site Plan Showing Existing Monitoring Well Locations
Figure 3	Conceptual Representation of Groundwater Flow in Site Vicinity
Figure 4	Site Plan Showing Recent TPHg Isoconcentration Contours in Site Vicinity
Figure 5	Site Plan Showing Recent Benzene Isoconcentration Contours in Site Vicinity
Figure 6	Site Plan Showing Proposed Monitoring Well Locations
Figure 7	Proposed Well Construction Diagram

#### List of Appendices

Appendix A	Regulatory Correspondence
------------	---------------------------

## 1.0 INTRODUCTION

Murex Environmental, Inc. (Murex) has prepared this Groundwater Monitoring Well Installation Workplan (Workplan) for the former Powerine Refinery site located at 12345 Lakeland Road in Santa Fe Springs, California (Site, see **Figure 1**). In particular, this Workplan outlines the proposed installation of additional monitoring wells for the purpose of 1) further delineating the dissolved-phase petroleum impacts within the Site's area of study and 2) providing additional delineation of petroleum-related and non-petroleum-related impacts potentially resultant from other sources.

This Workplan has been prepared to comply with Cleanup and Abatement Order (CAO) No. 97-118 issued by the Regional Water Quality Control Board, Los Angeles Region (RWQCB) to Powerine Oil Company (CENCO Refinery Company) in 1997, and to address the RWQCB request to submit a workplan for complete delineation of the hydrocarbon impacts to groundwater originating from the Site, as specified in a letter dated July 21, 2010. Regulatory correspondence is included in **Appendix A**.

### 1.1 Objective

The objective of the work proposed herein is to better define the lateral extent of free product and dissolved-phase petroleum impacts within the Site's area of study. Where possible, we also intend to identify where and to what extent impacts may be resultant from sources other than the Site, and where if applicable, multiple plumes have become comingled.

### 1.2 Report Organization

The following sections of this Workplan are organized as follows:

- **Section 2, Site Background:** This section describes the Site, its historical petroleum refining operations, and regional and local geology and hydrogeology.
- **Section 3, Off-Site Groundwater Characteristics:** This section provides an overview of impacts to groundwater in the vicinity of the Site.
- **Section 4, Proposed Plan:** This section describes the details and specifications of the proposed groundwater monitoring wells.
- **Section 5, Implementation Schedule:** This section outlines each task of the proposed plan and its expected timeframe for completion.

## 2.0 SITE BACKGROUND

### 2.1 Site Description and History

The site is approximately 55 acres in size and is bordered to the north by Florence Avenue, to the south by Lakeland Road, and to the east by Bloomfield Avenue (**Figure 2**). The Site is bordered on all sides by commercial and industrial properties. The Site operated as an oil refinery from the 1930s until July 1995. Oil-production-related structures such as ponds and aboveground holding tanks may have also been located on-Site during these years (Haley & Aldrich, 2005). The refinery is not currently in operation; however, some of the refinery structures remain on-Site. These structures are scheduled to be removed prior to the redevelopment of the property for commercial/industrial use.

Previous refining operations included processing crude oil into several grades of fuel including kerosene, leaded gasoline and aviation fuel, unleaded gasoline, jet fuel, high- and low-sulfur diesel, fuel oil, and petroleum coke. Soil and groundwater quality beneath and in proximity to the Site has been impacted by past Site operations. Groundwater monitoring is currently being conducted pursuant to CAO No. 97-118 issued by the RWQCB to Powerine Oil Company (CENCO Refining Company) in 1997. Groundwater monitoring data is presented regularly in quarterly monitoring reports submitted to the RWQCB.

### 2.2 Geology and Hydrogeology

#### 2.2.1 Regional Geology and Hydrogeology

The Site is located within the Santa Fe Springs Plain Subgeomorphic Province of the Los Angeles Coastal Plain at an elevation of approximately 130 to 140 feet above mean sea level (ft-amsl). This plain is a slightly-rolling topographic feature sloping gently to the northeast in the vicinity of the Site due to the northwest trending Santa Fe Springs–Coyote Hills anticlinal system. The Site is positioned above the southern limb of the Santa Fe Springs Anticline. Petroleum accumulation associated with this anticlinal structure has resulted in substantial oil production in the Santa Fe Springs area. Prominent topographic features in the area include the Puente and Coyote Hills to the northeast, east, and southeast. The San Gabriel River is located approximately 1.75 miles west of the Site and flows from north-northeast to south-southwest (Haley & Aldrich, 2005; Versar, 2000). A Site location map is included as **Figure 1**.

Several regional water-bearing units have been identified within the older alluvial fan and valley deposits of the Lakewood Formation and underlying San Pedro Formation. In the Site area, the Lakewood Formation begins at ground surface, ranges from 100 to 180 feet thick, and is composed of three hydrostratigraphic units: 1) the Bellflower Aquiclude (upper unit), 2) the

Exposition Aquifer, and 3) the Gage Aquifer. The Exposition and Gage aquifers consist predominantly of sands and fine gravels with discontinuous, thinly-bedded silts and clays. These aquifers have an approximate combined thickness of 100 to 150 feet, approximately half of which is saturated (Versar, 2000).

Within the Site vicinity, the Bellflower Aquiclude consists of a heterogeneous mixture of clays, silty clays, silts, and extensive interbedded lenses of sandy or gravelly silts and clays and has an estimated thickness between 20 and 40 feet. The major water-bearing unit of interest for this investigation is the Exposition Aquifer (otherwise known as the Artesia Aquifer), the upper water-bearing unit of the Lakewood Formation. The Exposition Aquifer is composed of coarse gravel, coarse to fine sand, and interbedded silts and clays with a general southwesterly dip and thickness between 40 and 80 feet. The Exposition Aquifer is separated from the Gage Aquifer by an unnamed aquiclude. Based on boring logs from the installation of monitoring wells MW-14 A/B/C, MW-15 A/B/C, and MW-16 A/B/C, this aquiclude appears prominently between approximately 130 to 170 feet below ground surface (ft-bgs; elevation 0 to 40 ft-amsl).

Information for the Site area in Santa Fe Springs indicates that the depth to first-encountered groundwater within the Exposition Aquifer ranges from 75 to 90 ft-bgs. The Gage Aquifer consists predominantly of sands and fine gravels with an estimated thickness between 30 and 60 feet (California Department of Water Resources [DWR], 1961; Versar, 2000; Haley & Aldrich, 2005).

### **2.2.2 Local Geology and Hydrogeology**

In the Site vicinity, the Santa Fe Springs Plain consists of the late-Pleistocene alluvium of the Lakewood Formation. The Lakewood Formation unconformably overlies the lower Pleistocene San Pedro Formation and the Pliocene Pico Formation. The Lakewood Formation consists of interbedded clays, silts, silty sands, and sands representative of stream-type alluvial and floodplain deposits (Versar, 2000). Previous subsurface investigations conducted at the site confirm that the lithology is a vertically and laterally heterogeneous mélange of such alluvial deposits (Haley & Aldrich, 2005; ARCADIS BBL, 2006; ARCADIS, 2009).

Underlying a surficial veneer of fill and roadbase materials at the Site are interbedded alluvial sediments ranging in texture from poorly-graded sands through fat clays. In general, the eastern portion of the Site contains more coarser-grained sediments (sand and gravel) than the western portion of the Site.

In January 2013, first-encountered groundwater was present beneath the Site vicinity at elevations ranging between approximately 16 and 51 ft-amsl (approximately 93 to 113 ft-bgs).

The groundwater flow direction originates from the northeast and turns south across the area of study under an average horizontal hydraulic gradient of 0.008 feet per foot (ft/ft; Murex, 2013). This direction and gradient are consistent with historical measurements.

### 2.3 Current Groundwater Monitoring Program

The groundwater monitoring program at the Site is performed on a quarterly basis. Currently, the program includes 59 monitoring wells, as depicted on **Figure 2**. A list of these wells is included below. It should be noted that 19 of these wells are now dry, as the groundwater table has decreased in elevation over time.

- Twenty-two on-Site groundwater monitoring wells: MW-101, MW-103, MW-104A, MW-105, MW-201, MW-202, MW-204, MW-205, MW-504, MW-701, MW-702, MW-703, MW-704, MW-705, MW-706, W-9, W-10, W-11, W-12, W-17A, W-17B, and W-17C.
- Twenty-five down-gradient off-Site groundwater monitoring wells, of which:
  - Four located on the former Lakeland property that include: MW-501A, MW-502, MW-503B, and MW-707; and
  - Twenty-one located on the MSH property that include: MW-600A, MW-601A, MW-603, MW-604, MW-605, MW-606, MW-607, MW-708, MW-709, MW-710, MW-711, MW-712, MW-713, MW-714, MW-715, W-14A, W-14B, W-14C, W-15A, W-15B, and W-15C.
- Seven off-Site groundwater monitoring wells located to the southeast on the Walker property including: W-1, W-3A, W-4, W-16A, W-16B, W-16C, and EW-1.
- Three off-Site groundwater monitoring wells located to the east on the Bloomfield property that include: MW-106A, MW-107A, and MW-203.
- Two on-Site deep, former water-production wells identified as W-7 and W-8.

All monitoring wells are gauged in a single day prior to purging. Currently, well purging is performed using a vacuum truck, with the exception of the former on-Site production wells W-7 and W-8. During purging, grab samples of the extracted groundwater are tested in the field for temperature, pH, electrical conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), color, and odor.

Groundwater samples from the monitoring wells are collected using disposable bailers and analyzed for:

- Total petroleum hydrocarbons as gasoline (TPHg) by United States Environmental Protection Agency (USEPA) Method 8015M, and
- Volatile organic compounds (VOCs) with oxygenates by USEPA Method 8260B.

Selected wells (a subset of approximately ten) are also subjected to analyses for bioremediation parameters. All samples are then transported to the selected laboratory under proper chain-of-custody procedures.

### 3.0 GROUNDWATER CHARACTERISTICS OF THE STUDY AREA

Groundwater has been studied at the Site since the 1990s. Since 2009, Murex has conducted work to characterize the extent of Powerine releases, which extend beyond the Site to the south, identify the nature and origin of dissolved-phase and free-product-phase hydrocarbons found in the monitoring well network, and to distinguish, when possible, likely impacts from the former refinery from impacts resultant from other sources. When the historical work performed on behalf of Powerine is reviewed in concert with maps, reports, and data from surrounding study areas, a less-clear picture emerges indicating the presence of several petroleum-related releases, varied groundwater flow directions, and multiple, possibly comingled, groundwater plumes. The following section discusses the findings of such a holistic review.

#### 3.1 Regional Groundwater Characteristics

In January 2013, first-encountered groundwater was present in the Powerine monitoring well network at elevations ranging between approximately 16 and 51 ft-amsl (approximately 93 to 113 ft-bgs). The groundwater flow direction measured in Powerine's monitoring well network originates from the northeast and turns south across the area of study under an average horizontal hydraulic gradient of 0.008 ft/ft (Murex, 2013). This direction and gradient are generally similar to historical data that have been collected from the Site's monitoring network since the early-2000s – with the flow direction generally varying from south to southwest beneath the site and south-southwest to south-southeast beneath the MSH property (down-gradient of the site). The groundwater gradient within the Powerine monitoring network has varied from 0.007 to 0.01 ft/ft during this same era.

However, data collected nearby but outside the Powerine well network area suggests a more complex flow regime. There are several properties in the Site vicinity that are also engaged in groundwater studies. Based on a review of recent data obtained from the California State Water Resources Control Board (SWRCB) online GeoTracker database (GeoTracker, 2013), groundwater to the north is depicted to flow towards the southwest to south-southwest, and to the east, groundwater is depicted to flow towards the west-southwest to south-southwest. When viewed as a whole, the data from Powerine and the other published studies suggest a funneling effect whereby Bloomfield Avenue south of Lakeland Road represents a low point towards which all northerly groundwater flows. A conceptual representation of this effect is illustrated on **Figure 3**.

### 3.2 Off-Site Impacts

In addition to data collected regularly through quarterly work, including checking wells for free-phase petroleum hydrocarbons (FPPH) and groundwater sampling of the Powerine monitoring wells, Murex reviewed data from other published reports on release sites in the area.

Based on that review, elevated concentrations of petroleum-related compounds are evident in the subsurface of the Site vicinity along multiple channels of groundwater flow. Powerine releases, apparently, have resulted in elevated concentrations of TPHg (up to 1,500 µg/L) and benzene (up to 390 µg/L) in the central and southwest portions of the Site, as well as a dissolved-phase plume that extends south to the central portion of the MSH property. In addition, a plume of FPPH is apparent along the northeastern (up-gradient) to southeastern (both up-gradient and cross-gradient) extents of the Site's monitoring network. To the east (up-gradient) of the Site, TPHg data is not available, though elevated concentrations of benzene (up to 1,400 µg/L) are again identified. To the east (up-gradient to cross-gradient) of the MSH property, elevated concentrations of TPHg and benzene are identified up to 14,000 µg/L and 950 µg/L, respectively. Recent analytical data and isoconcentration contours for TPHg and benzene in the Site vicinity are presented on **Figure 4** and **Figure 5**, respectively.

### 3.3 Known and Potential Contaminant Sources

Through groundwater sampling and forensic analysis of FPPH samples collected through the Powerine well network, Murex has historically identified evidence of petroleum releases from other sources.

There are numerous properties within the vicinity of the Site that have historically been involved in operations or processes associated with the extraction, refinement, storage, and/or usage of petroleum-hydrocarbon-related substances (i.e., extraction, storage, refinement of crude oil, storage of gasoline and gasoline additives, storage of diesel fuel, etc.). A number of these properties are located hydrogeologically up-gradient of the Site's groundwater monitoring network. Further, some of these properties have documented releases of petroleum substances that have resulted in subsurface impacts.

Based on documented releases, records of release-prone activities, and geographic position hydrogeologically up-gradient relative to the Powerine study area, the entities associated with these properties are considered potentially responsible parties (PRPs) for the known petroleum hydrocarbon impacts to groundwater in the Site vicinity – specifically to the northeast and east of the Powerine monitoring well network.

A list of some PRPs associated with petroleum-hydrocarbon-related releases or operations that are within the area of study is included below. Information on the following properties was obtained from GeoTracker, historical aerial photos, California Division of Oil, Gas, and Geothermal Resources (DOGGR) maps, California Department of Toxic Substances Control (DTSC), USEPA Facility Registry System (FRS), USEPA Toxics Release Inventory (TRI) online Envirofacts database, City of Santa Fe Springs Fire Department, and Sanitation Districts of Los Angeles County.

1. Breitburn Energy, 10735 Shoemaker Avenue, northeast of the Site: The property has been utilized for crude extraction and refining since approximately the 1920s/1930s.
2. Former Ashland Chemical Company, 10505 Painter Avenue, northeast of the Site: The property was utilized as a chemical distribution facility from the 1960s to 2002. A leak at the facility was first reported in 1983. Subsurface impacts to soil and groundwater reportedly include VOCs, including halogenated VOCs (HVOCs), associated with the facility, as well as BTEX compounds (benzene, toluene, ethylbenzene, and xylenes), TPH, hydrogen sulfide, and methane associated with historical oil field operations. Groundwater monitoring at the facility commenced in 1989; remediation activities at the facility commenced in 1996. The facility was issued a “no further action” (NFA) for soil in 2003; groundwater remediation is reportedly ongoing.
3. Goodrich Corporation, 11120 Norwalk Boulevard, southwest of the Site: The property is known to conduct chemical vapor deposition (CVD) processes to create carbon-carbon composite materials and components. This process has been conducted at the property since the early-1970s and is documented as generating benzene-laden wastewater. Records indicate that water likely contaminated with benzene has been regularly and repeatedly released at the facility, and several spills are documented.
4. Former Cascade Pump (Geminis Property Development), 11212 Norwalk Boulevard, southwest of the Site: A release of gasoline was identified during a UST removal at the property in the late-1990s. Groundwater monitoring at the property commenced in 2003; remediation activities at the property have been ongoing since 2007. This property adjoins the Former Water Well Supply property (below), and a majority of the regulatory documents/actions associated with the properties were conducted concurrently.
5. Former Water Well Supply, 11234 Norwalk Boulevard, southwest of the Site: A release of gasoline was identified during a UST removal at the property in the late-1990s.

Groundwater monitoring at the property was conducted from 2003 to 2009; remediation activities at the property were conducted in 2007. The property was issued a “no further action” (NFA) in 2012

6. Ultramar / Riverside Steel / Caminol Oil Company, 11401 Greenstone Avenue, southeast of the Site: The property was utilized for oil exploration beginning in 1919. A refinery operated at the property from approximately 1932 to 1955; information indicates the refinery was likely a topping plant that distilled crude oil into gasoline, kero-diesel, gas oil, and fuel oil products. A release of lead and petroleum/fuels/oils impacting groundwater was discovered in 1993; the case is reportedly ongoing.
7. Kalico Dump No. 1 / Kobra Dump / Kalico Dump No. 3, Greenstone Avenue (11921 Shoemaker Avenue), south-southeast of the Site: The properties operated as landfill/dump facilities from approximately the 1950s to the 1970s. Some of the types of materials the properties were permitted to accept include drilling mud from oil field drilling operations, residue and sludge from tanks used to store unrefined petroleum, and hydrocarbon cutting oils. Available records indicate that tank bottom waste, drilling mud, and unspecified aqueous solutions were received at the properties. The case for these properties is reported as open and inactive. Information indicates that current and historical addresses for these properties include various addresses on Greenstone Avenue, Shoemaker Avenue, Sunshine Avenue, and Imperial Highway.
8. Former Exxon-Mobil #18 F2Q, 12616 Imperial Highway, south-southeast of the Site: A release of gasoline at the property was discovered in 2004. Groundwater monitoring at the facility has been ongoing since 2005; remediation activities at the facility have been ongoing since 2009.

These sites, as well as locations of historical oil storage reservoirs and petroleum storage tanks, are shown on **Figure 3**.

### **3.4 Groundwater Well Network Data Gaps**

Based on the information discussed above, as well as data presented in the quarterly groundwater monitoring reports from 2011 and 2012, several data gaps exist; these data gaps are evidenced by two factors. First, there is significant evidence suggesting that petroleum hydrocarbons and related VOCs detected in Powerine's monitoring well network are resultant from sources other than the former Powerine Refinery. Additional monitoring wells are required to provide the necessary resolution within the monitoring well network in order to distinguish between Powerine and non-Powerine releases.

Second, the possibly comingled petroleum plume(s) appear to extend down-gradient beyond the capacity of the current wells to track it. FPPH was encountered in well MW-15A for the first time during the third quarter of 2011. Well MW-15A is the most southerly and furthest down-gradient well in the Powerine network.

## 4.0 PROPOSED PLAN

To assist in further delineation of the groundwater plume in the area of study, Murex is proposing to install 13 additional monitoring wells south of the Site. The locations of the proposed monitoring wells are presented on **Figure 6**.

The well locations have been selected to address data gaps for light non-aqueous phase liquid (LNAPL) and dissolved-phase hydrocarbon plume delineation within the Site's area of study. The locations were selected to most efficiently define the extents of the Powerine off-Site plume, the extents of releases by other PRPs, and where access was likely to be granted by either private land owners, City of Santa Fe Springs, City of Norwalk, or the MSH.

In general, the wells will be installed to a depth of approximately 130 ft-bgs, with a well screen extending both 25 feet above and 25 feet below the water table, as measured during drilling, similar to the construction of the previous series of monitoring wells, MW-701 through MW-715. Based on historical drilling at the Site, as well as literature sources, an unnamed aquiclude, separating the Exposition and Gage Aquifers may occur between approximately 130 ft-bgs and 170 ft-bgs. Geologic conditions encountered in the field will guide the installation of the wells, which may result in slight modifications to the proposed well design.

### 4.1 Pre-Field Activities

Prior to the start of the field mobilization, several preliminary tasks will be completed, as outlined below.

1. Access Agreements – Lakeland has established access agreements for the previous installation of monitoring wells and the ongoing sampling of groundwater from those wells at the MSH property, as well as the “Coaster,” “Walker,” and “Bloomfield” properties to the south and east. These agreements must be updated and approval must be given for the new scope of work to install additional groundwater monitoring wells. In addition, encroachment permits from the City of Santa Fe Springs, the City of Norwalk, and private property (vacant lot) may be necessary.
2. Health & Safety – Murex will update the Site Health & Safety Plan to address activities associated with the new scope of work.
3. Mark-Out – Murex will visit the Site to mark proposed boring locations in white paint. At that time, proposed locations may be moved if necessary to make safe working

access possible. The RWQCB will be notified if any point requires relocation greater than 50 feet from the approved location.

4. Utility Clearance

- a. Murex will notify Underground Service Alert (USA) of the impending subsurface work at least one week prior to the start of sampling. USA will mark the locations of public and private utilities on public property, and note where utilities enter private land.
  - b. Murex will review available utility and as-built drawings of the area at the City of Santa Fe Springs and the City of Norwalk Engineering Divisions.
  - c. Murex will visit the locations of the proposed borings thereafter with a private utility location service. A geophysical survey will be conducted to locate underground utilities in the vicinity of proposed drilling locations using electromagnetic pipe- and cable-scanning devices, induction and metal detection, and ground-penetrating radar (GPR).
5. Well Permits – Murex will procure well installation permits from the Los Angeles County Department of Environmental Health for the installation of 13 groundwater monitoring wells.
6. Notifications – Murex will make the following notifications:
- a. Notify the Department of Public Works for the City of Santa Fe Springs and the City of Norwalk regarding the planned activities in the city street right-of-way,
  - b. Notify the RWQCB at least five days prior to the start of field work, and
  - c. Notify nearby properties, as applicable, for access of proposed field activities at least five days prior to the start of fieldwork.
7. Retain drilling contractor, analytical laboratory, disposal contractor, and land surveyor for the proposed scope of work.

## 4.2 Monitoring Well Installation

Thirteen (13) wells will be installed to assist in the further delineation of the groundwater plume in the area of study. The following subsections present the well specifications, development method, and sampling program. The locations of the proposed monitoring wells are presented on **Figure 6**.

#### **4.2.1 Drilling and Sampling**

Murex will conduct the drilling operation under an approved health and safety program, using a California-licensed driller under the direction of a California-registered geologist. Borings will be advanced using a 10-inch hollow-stem auger with a split-spoon drive hammer to collect soil samples at every 5 feet for lithologic logging. Soil samples will be screened in the field using a photo-ionization detector (PID). Analytical sampling is not proposed for the vadose zone or saturated zone soils.

#### **4.2.2 Free-Phase Petroleum Hydrocarbon (FPPH) Sampling**

At selected well locations, an approximate 25-foot length of continuous-core sampling will be performed from approximately 20 feet above to approximately 5 feet below the water table. The cores will be examined for the presence of NAPL, and screened using a PID.

#### **4.2.3 Monitoring Well Construction**

The wells will be installed to an approximate depth of 130 ft-bgs. The wells will be screened approximately 25 feet above and 25 feet below the water table to accommodate for future groundwater elevation fluctuation. The wells will be constructed from four-inch diameter, schedule 40 PVC casing and screen. The screen slot size will be 0.02 inches and the filter pack will be clean #2/12 sand. The actual design of the well-screen interval will be determined in the field based on soil lithology. Generally, wells will be screened according the following criteria:

A minimum of a three-foot seal above the filter pack will be composed of bentonite chips hydrated with water. The well annulus above the screened interval will be backfilled with high-solids bentonite grout. The surface completion will be constructed with an EMCO Wheaton traffic-rated well box set in concrete. A diagram of typical well construction is provided as **Figure 7**; proposed well construction details are included in **Table I**.

#### **4.2.4 Well Development and Groundwater Sampling**

Following a minimum of 72 hours after well installation, the monitoring wells will be developed using a surge block to bring fines into the well annulus and further settle the filter pack. The wells will then be purged of groundwater using a submersible pump. During the purging process, turbidity will be measured and recorded to ensure that formation water has entered the well casing and the well will provide a groundwater sample representative of the aquifer. Purging will continue until successive measurements stabilize within a range of 10% for each parameter. The purge volume will not be less than 10 well-casing volumes.

#### **4.2.5 Well Surveying**

The newly-installed groundwater monitoring wells will be surveyed by a California-licensed surveyor relative to the city/county benchmark used during previous well surveys. The wellhead casing elevation will be surveyed to the nearest 0.01 foot. The top of the well casing will be notched and permanently marked with the survey point upon which subsequent water measurements will be obtained. The licensed surveyor will make the longitude and latitude measurements with a Global Positioning System (GPS) instrument in compliance with GeoTracker requirements and in accordance with Assembly Bill 2886.

#### **4.2.6 Groundwater Sampling and Analysis**

Depths to the groundwater and/or FPPH surface will be measured in the monitoring wells using an electronic oil-water interface probe, and the value will be subtracted from the top-of-casing (TOC) elevation to determine groundwater elevation in ft-amsl. The data will be used to evaluate groundwater elevation and flow direction.

Prior to collecting samples, groundwater will be purged from each monitoring well (except in wells containing FPPH, where no sampling will occur) by low-flow methodology at a rate of approximately 100 to 200 milliliters per minute using a stainless-steel submersible pump. The pump will be set approximately three feet below the water table, and a water level meter will be used to verify that no drawdown occurs during the low-flow pumping. Groundwater quality field parameters (i.e., temperature, pH, electrical conductivity, DO, ORP, color, and odor) will be measured during purging, and groundwater samples will be collected after field parameters stabilize to within 10%. Non-dedicated sampling equipment will be decontaminated before use in each well.

One equipment blank will be collected from the groundwater sampling equipment for each monitoring event and submitted for VOC analysis. One duplicate sample for every approximately 10 samples will be collected each monitoring event to evaluate whether VOC concentrations are within the acceptable range of the primary sample. A trip blank for each travel container (i.e., one per day) will be prepared and will accompany the samples during transport to the laboratory. All groundwater samples will be collected in laboratory-supplied sample containers preserved with hydrochloric acid (HCl), sealed, labeled, stored in a pre-cooled ice chest, and transported under chain-of-custody manifest to a California-certified laboratory. The laboratory method blank and sample holding times will be evaluated to verify adherence to USEPA-approved laboratory analysis requirements. The samples will be logged onto and be accompanied by a chain-of-custody form from the time of collection until delivery to the analytical laboratory.

#### **4.3 Data Evaluation and Reporting**

Murex will analyze the findings of the field measurements and laboratory analysis, and continue to submit reports to the RWQCB on a quarterly basis, pursuant to the CAO.

## 5.0 IMPLEMENTATION SCHEDULE

Lakeland proposes to conduct the monitoring well installation upon approval of this Workplan. The following estimated schedule highlights milestones and preliminary estimates on the required time to complete each.

<u>Milestone</u>	<u>Estimated Task Duration</u>
Pre-Field Activities	
Access Agreements	8 Weeks <sup>1</sup>
Health & Safety	1 Week
Mark-Out	1 Week
Utility Clearance	2 Weeks <sup>2</sup>
Well Installation	4 Weeks <sup>2</sup>

We estimate that a well completion report and results from sampling these new wells can be provided to the RWQCB within approximately five months of approval of this Workplan, provided the above-described timelines can be met.

<sup>1</sup> This estimate is dependent upon agreement from property owners.

<sup>2</sup> Estimate subject to subcontractor availability.

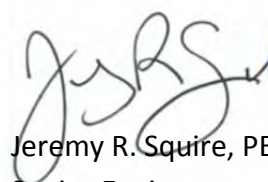
## 6.0 CLOSING

I certify under penalty of law that this document and all enclosures were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. The information contained herein is, to the best of my knowledge and belief, true, accurate and complete, however, is reliant upon public agency records, which could be incomplete or inaccurate beyond our control.

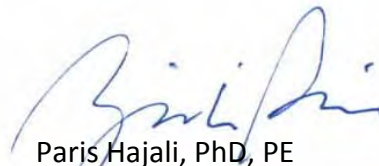
Should you have any questions or concerns regarding the material herein, please do not hesitate to contact the undersigned at (714) 508-0800.

Sincerely,

MUREX ENVIRONMENTAL, INC.

  
Jeremy R. Squire, PE  
Senior Engineer



  
Paris Hajali, PhD, PE  
Principal

## 7.0 REFERENCES

1. ARCADIS BBL. 2006. *Additional Site Investigation Report, Former CENCO Refinery, 12345 Lakeland Road, Santa Fe Springs, California*. Prepared for Isola & Associates, LLP. August 8.
2. ARCADIS. 2009. *First Quarter 2009 Groundwater Monitoring Report, Former CENCO Refinery, 12345 Lakeland Road, Santa Fe Springs, California*. Prepared for Isola Law Group, LLP. May 1.
3. ARCADIS. 2013. *2012/2013 Additional Site Assessment, Former Riverside Steel, Santa Fe Springs, California*. Prepared for Ultramar, Inc. March 15.
4. California Department of Water Resources (DWR). Bulletin No. 104. June 1961, Reprinted May 1988. *Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County, Appendix A Groundwater Geology*.
5. California Department of Water Resources (DWR) Southern District. October 2001. *Watermaster Service in the Central Basin, Los Angeles County*. (July 1, 2000 – June 30, 2001).
6. Cardno ERI. 2013. *Fourth Quarter 2012 / First Quarter 2013 Semiannual Groundwater Monitoring and Status Report, Former Mobil Station 18F2Q, Norwalk, California*. Prepared for ExxonMobil Oil Corporation. February 27.
7. CH2M Hill. 2012. *Groundwater Monitoring Report for 2010 and 2011, Omega Chemical Corporation Superfund Site, Los Angeles County, California*. Prepared for U.S. Environmental Protection Agency, Region 9. June.
8. *DOGGR Online Mapping System (DOMS)*. California Division of Oil, Gas, and Geothermal Resources (DOGGR). Web. May 2013.
9. EHS Support, LLC. 2013. *Second Semiannual 2012 Monitoring Report, Former Ashland Chemical Company Facility, Santa Fe Springs, California*. Prepared for Ashland, Inc. January 15.
10. *Envirofacts*. United States Environmental Protection Agency (USEPA), Toxics Release Inventory (TRI). Web. June 2007.

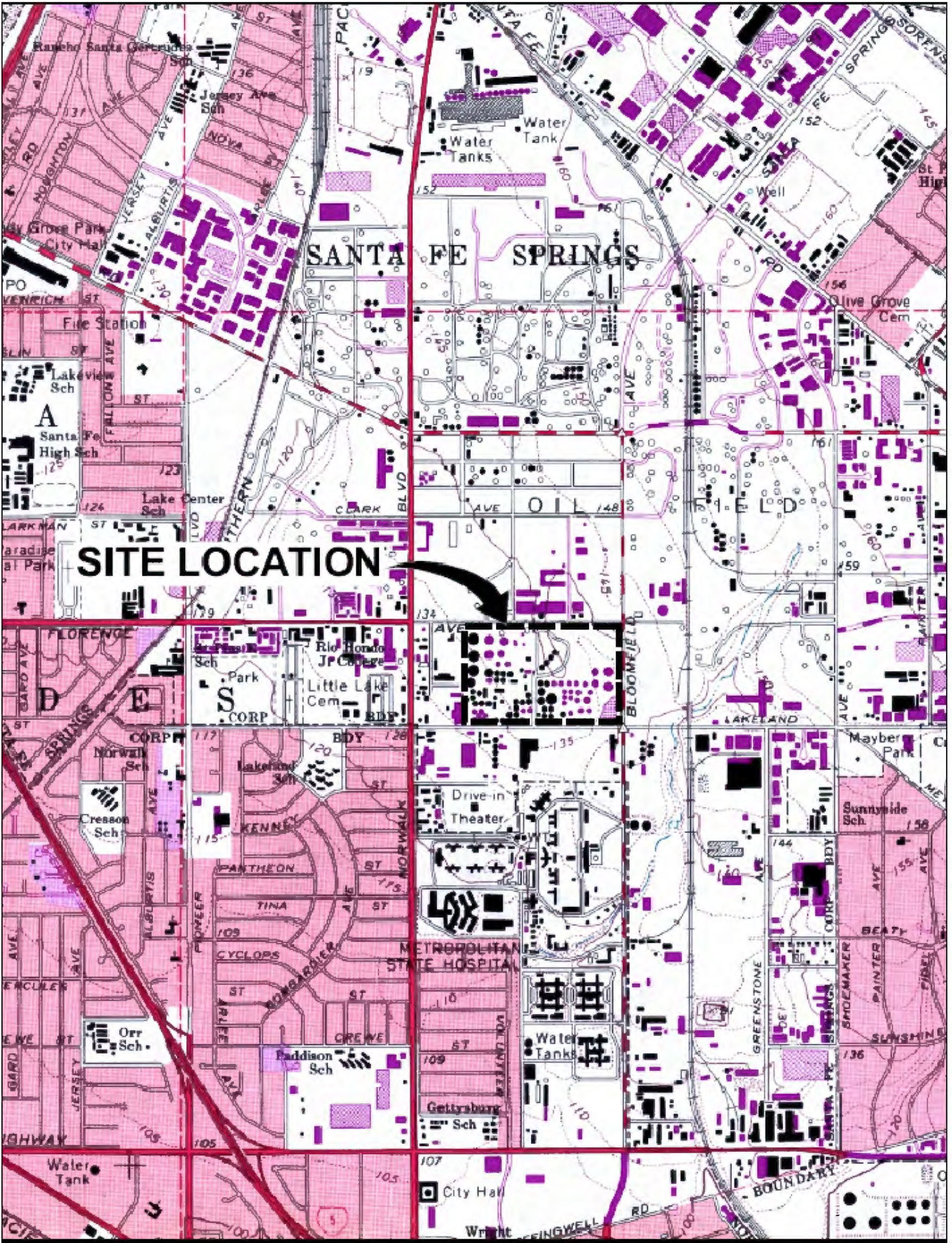
11. Environmental Data Resources, Inc. (EDR). 2013. *The EDR Aerial Photo Decade Package, Metropolitan State Hospital, Norwalk, California*. Prepared for Murex. April 17.
12. Environmental Solutions, Inc. 1990. *First Quarter Status Report, Combined Solid Waste Assessment Test (SWAT), Kalico Dump No. 1, Kobra Dump, Kalico Dump No. 3, Santa Fe Springs, California*. Submitted to California Regional Water Quality Control Board. June 11.
13. *Facility Registry Service (FRS)*. United States Environmental Protection Agency (USEPA). Web. May 2013.
14. *GeoTracker*. California State Water Resources Control Board (SWRCB). Web. May 2013.
15. Haley & Aldrich. 2005. *Additional Site Investigation Workplan, CENCO Refining Company, 12345 Lakeland Road, Santa Fe Springs, California*. Prepared for Isola Bowers, LLP. May 9.
16. *Historic Aerials*. Nationwide Environmental Title Research, LLC (NETR). Web. May 2013.
17. Murex. 2013. *First Quarter 2013 Groundwater Monitoring Report, Former Powerine Refinery, 12345 Lakeland Road, Santa Fe Springs, California*. Prepared for Isola Law Group, LLP. April 15.
18. Versar. 2000. *Revised Master Workplan, CENCO Refining Company, Santa Fe Springs, California*. Prepared for CENCO Refining Company. January 28.

**Table I**  
**Proposed Well Construction Details**  
**Former Powerine Refinery**  
**Santa Fe Springs, CA**

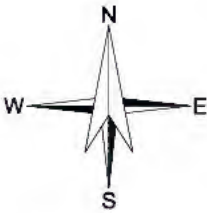
Well ID	Hole Diameter (in)	Casing Diameter (in)	Screen		Depth (ft)						Location
			Slot (in)	Length (ft)	Sand Pack		Slotted		Total Depth		
					Top	Bottom	Top	Bottom	Casing	Hole	
MW-716	12	4	0.02	50	77	130	80	130	130	130	Florence Avenue
MW-717	12	4	0.02	50	77	130	80	130	130	130	Lakeland Road
MW-718	12	4	0.02	50	77	130	80	130	130	130	Vacant Lot
MW-719	12	4	0.02	50	77	130	80	130	130	130	Walker Property
MW-720	12	4	0.02	50	77	130	80	130	130	130	MSH Property
MW-721	12	4	0.02	50	77	130	80	130	130	130	MSH Property
MW-722	12	4	0.02	50	77	130	80	130	130	130	MSH Property
MW-723	12	4	0.02	50	77	130	80	130	130	130	Bloomfield Avenue
MW-724	12	4	0.02	50	77	130	80	130	130	130	Cyclops Street
MW-725	12	4	0.02	50	77	130	80	130	130	130	Volunteer Avenue
MW-726	12	4	0.02	50	77	130	80	130	130	130	MSH Property
MW-727	12	4	0.02	50	77	130	80	130	130	130	MSH Property
MW-728	12	4	0.02	50	77	130	80	130	130	130	Allard Street

**NOTES:**

ft            feet  
in            inches  
MSH        Metropolitan State Hospital



SOURCE OF BASE MAP  
U.S. GEOLOGICAL SURVEY, 7.5 MIN QUAD., WHITTIER, CA. 1965, PHOTOREVISED 1981



SCALE: NOT TO SCALE

FORMER POWERLINE REFINERY  
12345 LAKELAND ROAD  
SANTA FE SPRINGS, CALIFORNIA

SITE LOCATION MAP



FIGURE  
1

DRAWN BY: RLM    REVISION DATE: 5/15/12    REVISED BY: BER

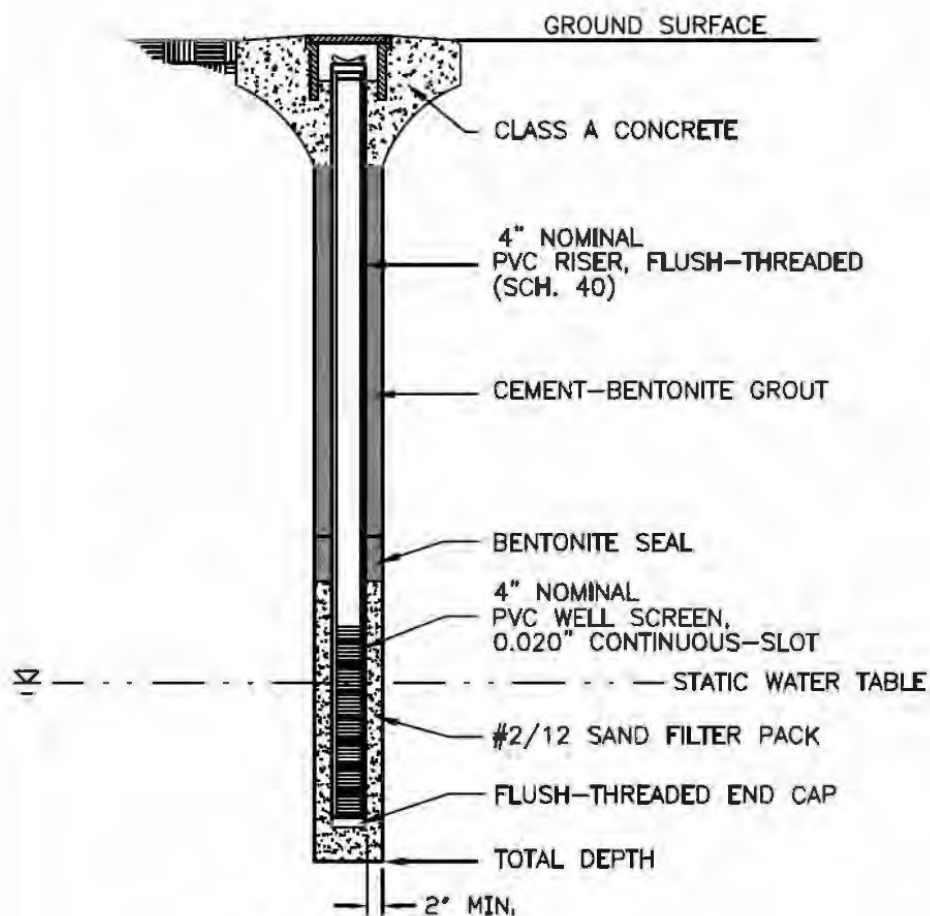
# FX-9: Wells

# FX-9: Wells

# FX-9: Wells

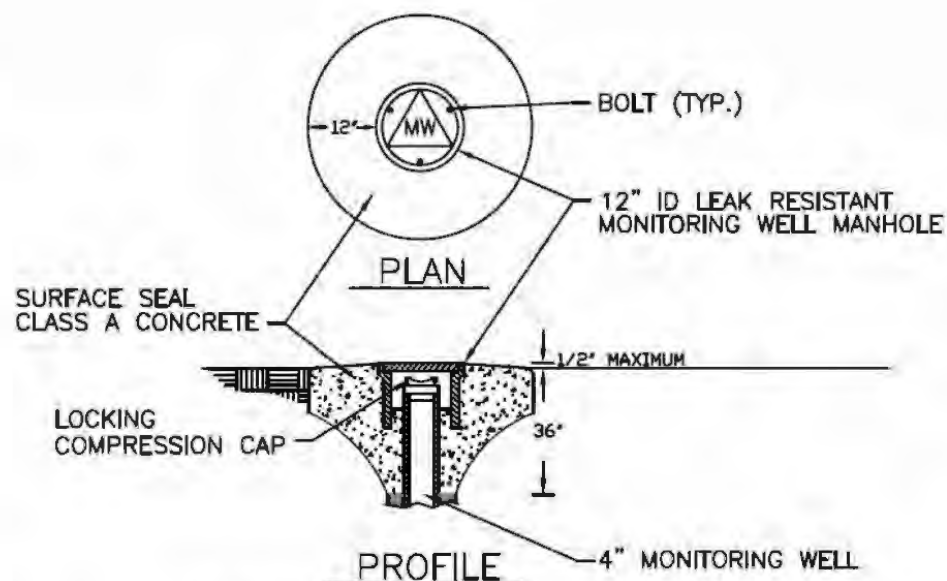
# FX-9: Wells

# FX-9: Wells



MONITORING WELL  
CONSTRUCTION DETAIL

N.T.S.



MONITORING WELL FLUSH  
MOUNT COMPLETION DETAIL

N.T.S.

CENCO REFINING COMPANY  
12345 LAKE LAND ROAD  
SANTA FE SPRINGS, CALIFORNIA

TYPICAL PROPOSED WELL  
CONSTRUCTION DIAGRAM



FIGURE  
7

# **Appendix A**



# California Regional Water Quality Control Board

## Los Angeles Region



Linda S. Adams  
Cal/EPA Secretary

320 W. 4th Street, Suite 200, Los Angeles, California 90013  
Phone (213) 576-6600 FAX (213) 576-6640 - Internet Address: <http://www.waterboards.ca.gov/losangeles>

Arnold Schwarzenegger  
Governor

July 21, 2010

Mr. Mike Barranco  
Lakeland Development Company  
12345 Lakeland Road  
Santa Fe Springs, California 90670

**REQUIREMENTS FOR SUBSURFACE INVESTIGATION AND CLEANUP PURSUANT TO  
CLEANUP AND ABATEMENT ORDER NO. 97-118, FORMER POWERINE / CENCO  
REFINERY, 12345 LAKELAND ROAD, SANTA FE SPRINGS, CALIFORNIA, (SCP NO. 0318A,  
SITE ID NO. 2040071)**

Mr. Barranco:

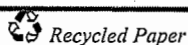
The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) is the state regulatory agency responsible for protecting water quality in Los Angeles and Ventura Counties, including the above-referenced site (Site). To accomplish this, the Regional Board issues investigative orders, cleanup and abatement orders, waste discharge requirement permits, tank cleanup orders, and other directives authorized by the Porter- Cologne Water Quality Control Act or the California Health and Safety Code.

You are subject to Cleanup and Abatement Order (CAO) No. 97-118 issued to Powerine Oil Company (Powerine) on August 25, 1997, pursuant to California Water Code section 13304. CAO 97-118 ordered Powerine, as the responsible party, to investigate, cleanup and abate soil contamination and groundwater pollution at, and groundwater pollution emanating from, the subject facility at 12345 Lakeland Road in Santa Fe Springs, California. The requirements of CAO 97-118 apply to Lakeland Development Company as the successor to Powerine. The Department of Toxic Substances Control (DTSC) is coordinating with Regional Board staff to review site documents and thereby ensure that risks to human health are addressed by your investigations.

The Regional Board has received the *Second Quarter Groundwater Monitoring Report*, dated June 25, 2010 and submitted by your consultant, Murex Environmental. A large number of wells sampled in the monitoring program no longer have groundwater and hydrocarbon impacts cannot be determined. We have thus determined that additional work is necessary to maintain groundwater monitoring capability in groundwater beneath, and extending down-gradient from, the Site. You shall submit a workplan for complete delineation of the hydrocarbon impacts to groundwater originating from the Site. The groundwater workplan shall include north-to-south and east-to-west cross sections depicting hydrostratigraphic units beneath the Site interpreted from borehole logs, existing and proposed groundwater monitoring wells with depth and perforation intervals, and historical and current groundwater levels. Submit this Groundwater Monitoring Workplan to the Regional Board and the DTSC by **September 3, 2010**.

The Regional Board received the *Revised Off-Site Soil Gas Survey Workplan*, dated August 14, 2007, approved it in a letter dated January 11, 2008, and extended the due date to August 29, 2008 in a June 20, 2008 letter. Regional Board staff understand the execution of the workplan has been prevented due to property access and financial issues, which have since been resolved. You shall submit a revised soil gas

**California Environmental Protection Agency**



Our mission is to preserve and enhance the quality of California's water resources for the benefit of present and future generations.

July 21, 2010

survey workplan that incorporates delineation of elevated volatile organic compound (VOCs) concentrations in soil gas, offsite to the south, beneath Lakeland Road and beyond as necessary. Propose sample locations to assess VOC concentrations in the soil gas in the Metropolitan State Hospital facility. Include a health and safety plan, and soil gas investigation quality assurance (QA)/ quality control (QC) protocol. Submit this Revised Off-Site Soil Gas Assessment Workplan to the Regional Board and DTSC by **September 3, 2010**.

The Regional Board received the *Free Phase Petroleum Hydrocarbon Investigation Work Plan*, dated August 31, 2007, approved it in a letter dated January 11, 2008, and extended the due date to August 29, 2008 in a June 20, 2008 letter. No technical report has been submitted and your ability to determine the extent and thickness of free-phase petroleum hydrocarbons is severely restricted by the falling groundwater levels noted above. You shall submit an update to the *Free Phase Petroleum Hydrocarbon Investigation Work Plan* including recent data and data gaps, and a proposed schedule for the completion of the work. Submit this Revised Free Phase Petroleum Hydrocarbon Investigation Workplan to the Regional Board and DTSC by **September 3, 2010**.

The Regional Board has received the *Supplemental Soil Investigation Report*, dated June 8, 2009. With this submission, sufficient information regarding site contaminants and characteristics has been accumulated to allow the evaluation of potential remedial technologies that could be included in a Remedial Action Plan. You shall submit a workplan to perform pilot and/or bench scale testing on considered remedial technologies for soil and groundwater. The purpose of the testing is to develop and confirm design parameters for remediation. The workplan must include the technologies, method of testing, and an implementation schedule. Furthermore, the testing plan must address the Site specific conditions and must be representative of the various soil and contaminant conditions at the Site. Submit this Pilot Testing Workplan to the Regional Board and DTSC by **September 17, 2010**.

The workplans are required under CAO No. 97-118. Pursuant to section 13308 of the California Water Code you are required to submit the above-referenced workplans by the due dates. Failure to submit the required technical reports/workplans by the specific due dates may result in civil liability administratively imposed by the Regional Board in an amount up to one thousand dollars (\$1,000) for each day the technical reports/workplans are not received.

Please note that effective immediately, the Regional Board requires you to include a perjury statement in all work plans and reports submitted under 13267 orders and CAOs. The perjury statement shall be signed by a senior authorized representative of Lakeland Development Company (and not by a consultant). The statement shall be in the following format:

"I [NAME], do hereby declare under penalty of perjury under the laws of California, that I am [JOB TITLE] for [Subject Site], that I am authorized to attest to the veracity of the information contained in the reports described herein, and that the information contained [NAME AND DATE OF REPORT] is true and correct, and that this declaration was executed at [PLACE], [STATE], on [DATE]."

The State Water Resources Control Board (State Water Board) adopted regulations requiring the electronic submittals of information over the Internet using the State Water Board GeoTracker database.

Mr. Mike Barranco, Lakeland Development. Co. - 3 -  
Former Powerline / CENCO Refinery

July 21, 2010

You are required not only to submit hard copy reports required in this Order but also to comply by uploading all reports and correspondence prepared to date and additional required data formats to the GeoTracker system. Information about GeoTracker submittals, including links to text of the governing regulations, can be found on the Internet at the following link:

[http://www.waterboards.ca.gov/water\\_issues/programs/ust/electronic\\_submittal](http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal)

As presented in State Water Resources Control Board Resolution 92-49, professionals should be qualified, licensed where applicable, and competent and proficient in the fields pertinent to the required activities. Moreover, the final report submitted to this Regional Board must be reviewed, signed and stamped by a California registered geologist, or a California registered civil engineer with at least five years hydrogeologic experience. Furthermore, the California Business and Professions Code Sections 6735, 7835, and 7835.1 require that engineering and geologic evaluations and judgments be performed by or under the direction of a registered geologist or registered civil engineer. A statement is required in the final report that the registered professional in responsible charge actually supervised or personally conducted all the work associated with the work plan and final report.

**If you have any questions regarding this project, please contact Don Indermill of my staff at (213) 576-6811 or [dindermill@waterboards.ca.gov](mailto:dindermill@waterboards.ca.gov).**

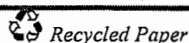
Sincerely,



Samuel Unger  
Interim Executive Officer

cc: Steve Hariri, Department of Toxic Substances Control, Cypress, CA  
Paris Hajali, Murex Environmental Inc., Tustin CA  
David Isola, Isola & Ruiz, LLP, Lodi, CA

***California Environmental Protection Agency***



*Our mission is to preserve and enhance the quality of California's water resources for the benefit of present and future generations.*